

Adding biology to the PTM

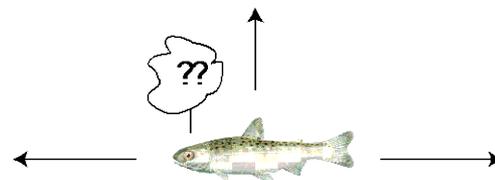
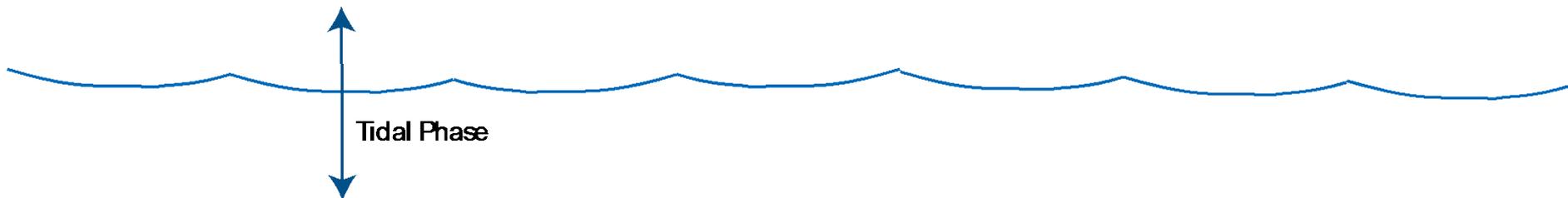
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Day/Night



swim, drift, hold position

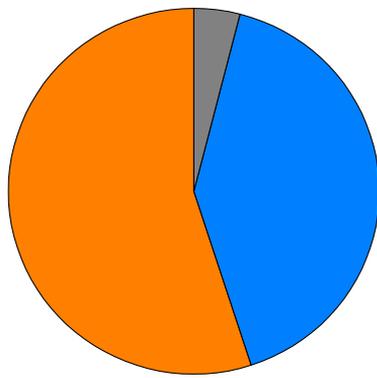


Behavior models

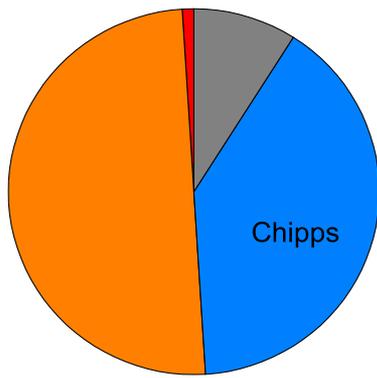
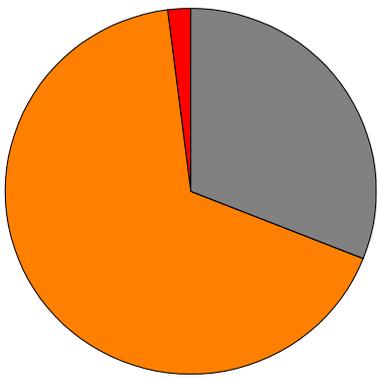
| Cue | Response |
|-------------------|--|
| None | Drift |
| Channel direction | Swim towards ocean |
| Tide phase | Swim with flow on falling tide; hold or drift on rising tide |
| Flow | Swim with flow; swim with flow when positive and drift or hold when negative |
| Salinity | Swim towards salt when in brackish water |

San Joaquin R release (1 June 2002)

Swim with flow on falling tide; drift



Drift with flow

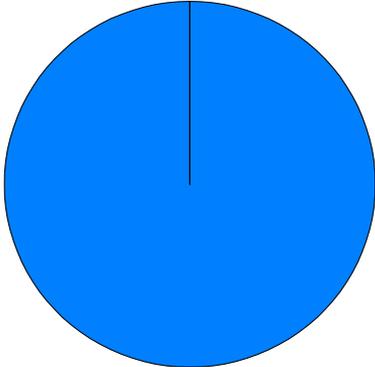


SWP

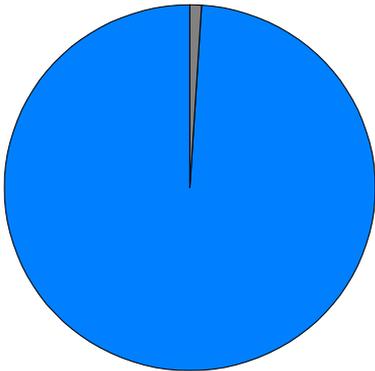
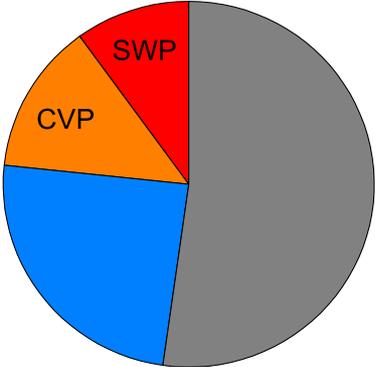
pps

Sacramento R release (1 June 2002)

Swim with flow on falling tide; drift



Drift with flow



ipps



<http://www.ickr.com/photos/40626436@N00/3098913729/>



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The XT Model

$$S = \exp \left(-a \rho x \sqrt{1 + \left(\frac{\omega}{U} \right)^2} \right)$$

The diagram shows the equation $S = \exp \left(-a \rho x \sqrt{1 + \left(\frac{\omega}{U} \right)^2} \right)$ with several arrows pointing to its components. An arrow points from the text 'Area in which a predator can detect, pursue, capture, and consume prey. Depends on reaction distance of predator to prey, which can be influenced by turbidity.' to the variable a . Another arrow points from 'Predator density' to ρ . A third arrow points from 'Distance travelled' to x . A fourth arrow points from 'Mean velocity of prey relative predator' to U . A fifth arrow points from 'Variation in velocity of prey relative to predator' to ω .

Special cases of XT model:

Gauntlet model: depends only on distance ($U \gg \omega$)

Exposure time model: depends only on time ($\omega \gg U$)

The Gauntlet model:

$$S = \exp(-rx)$$

The exposure time model:

$$S = \exp(-r\omega t)$$

The constant- ω exposure time model:

$$S = \exp(-rt)$$

where

r is mortality rate

x is distance traveled

t is travel time

Model Comparison

| Model | NLL | AIC | Δ AIC | R ² |
|----------------------------------|------|------|--------------|----------------|
| XT model | 28.5 | 61.1 | 26.0 | 0.576 |
| Gauntlet model | 25.2 | 54.4 | 29.3 | 0.621 |
| Exposure time model | 30.8 | 65.6 | 30.5 | 0.543 |
| Constant- ω exposure time | 15.5 | 35.1 | 0 | 0.726 |

When reach is added to best model:

| | | | | |
|---------------------------|------------|-------------|--|--------------|
| Best model + reach | 7.5 | 32.9 | | 0.790 |
|---------------------------|------------|-------------|--|--------------|

Comparison Among Reaches

